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# FOREST PEST MANAGEMENT

BIOLOGICAL EVALUATION R2-84-6

Mountain Pine Beetle
in Ponderosa Pine

Laramie Peak

Medicine Bow National Forest
1984

United States
Department of
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Forest Pest Management
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## INTRODUCTION

The mountain pine beetle (MPB), Dendroctonus ponderosae Hopkins, is a major cause of extensive mortality of ponderosa pine, Pinus ponderosae Laws, and lodgepole pine, Pinus contorta Douglas, in portions of 355,874 acres of host type on the Medicine Bow National Forest, Wyoming.[1/] Based on aerial reconnaissance surveys conducted during the week of August 6, 1984, the number of newly infested trees was estimated at about 6,049 trees covering about 4,917 acres of Forest Service land.

During the week of September 24, 1984, ground surveys were conducted in the Laramie Peak area (Figure 1) where MPB caused tree mortality had been detected. The surveys were conducted to determine infestation attack ratio; number of infested trees per acre, predicted impact of MPB on stands.

## METHOD

Combined variable plot and strip cruises were conducted along the Cottonwood creek drainage and Eagle Peak areas south and west of Laramie Peak respectively. Cruise lines were one (1) chain wide, ten (10) chains apart and of variable lengths (10 to 40 chains). Each MPB attacked tree was counted, measured (dbh to nearest 0.1 inch) and ranked by estimated year of attack as follows: 1984-infested; 1983-infested; 1982-infested. Variable plots (10 BAF) were located at the beginning and end of each cruise line and spaced at 10 chain intervals along cruise lines. All green ponderosa pine, lodgepole pine, limber pine, aspen, and fir trees were tallied and diameters measured.

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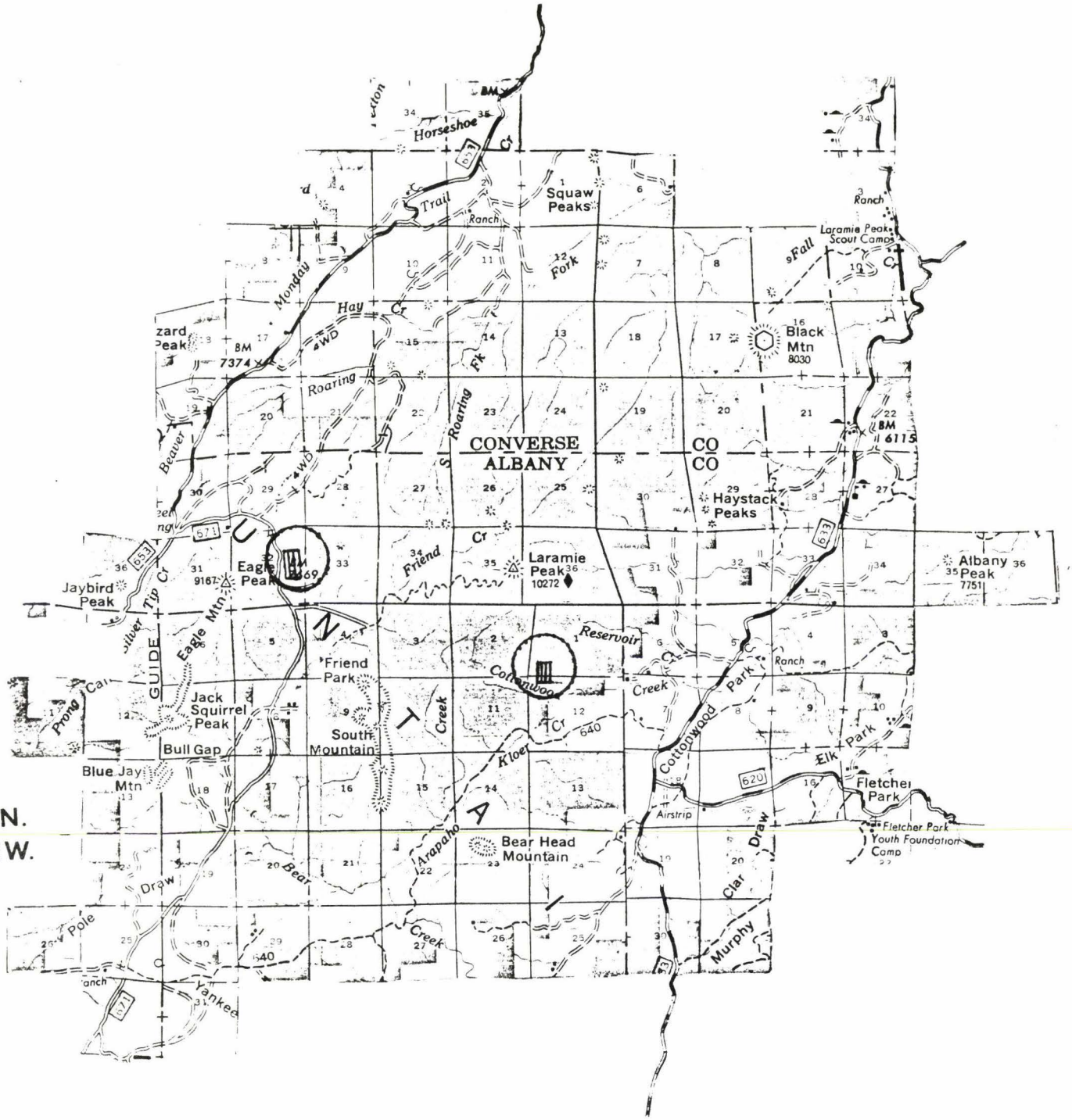
1/ Timber inventory data on file with USDA Forest Service TFP & CFM, Regional Office, Lakewood, CO.

FIGURE 1 -- Laramie Peak area map. Medicine Bow National Forest.

Area of survey lines conducted during September 25-27, 1984.



## STATISTICAL TREATMENT

Multiple regression equations were applied to estimate the percent of trees expected to be lost in a stand in the event of MPB infestation. The following assumptions are included with the predictions: There are three phases of MPB infestation - Increasing, Epidemic, and Decreasing; infestation lasts nine (9) years (3 years per infestation phase) (Lessard, 1981); biotic and abiotic conditions are optimal for the life of the epidemic (Cole, McGregor 1983).

## RESULTS AND DISCUSSION

A summary of Ponderosa pine data for the entire survey area is given in Table 1. The overall average diameters (dbh-inches) by infestation class are 10.7 (uninfested); 11.3 (1984 infested); and 11.0 (1983-infested). The overall basal area is 101 sq. ft. per acre.

A summary of the strip cruise data is given in Table 2. The greatest number of 1984 attacked trees were found in the Cottonwood Creek area southeast of Laramie Peak. This area shows an increase of MPB attacks from 1983 to 1984 (2.5:1.0 attack ratio). The Eagle Peak area (west of Laramie Peak) showed a slight decrease in attacks from 1983 to 1984 (0.4:1.0 ratio). The attack ratio for the entire area is 1.4:1.0. This indicates a static to increasing attack trend from 1983 to 1984.

Variable plot data is provided in Table 3. The highest basal area (BA) estimates are in the Cottonwood Creek area stands. Here, BA per plot ranged from 120 to 230 sq. ft. per acre (Ponderosa pine) with an average of 154 sq. ft. per acre. Average BA for aspen is 1.8 sq. ft. per acre.

Ponderosa pine was absent in thirty (30) percent of the sampled plots, Lodgepole absent in fifty (50) percent, and aspen absent in sixty (60) percent. Basal area estimates per plot were highly variable due to this lack of uniform distribution.

TABLE 1--DATA SUMMARY OF ALL STANDS

| Number of Plots | | DIAMETER OF PONDEROSA PINE BY MPB INFESTATION CLASS | | | | | DIAMETER OF OTHER SPECIES (dbh-in) VARIABLE PLOT | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Unin-fested | 1983 Infested | 1982 Infested | Pitch Outs | BA (10) (BAF) | Aspen | Lodge-pole | Fir | Limber Pine |
| 22 | N | 217 | 20 | 18 | 1 | | 36 | 64 | 1 | 1 |
| | X | 10.7 | 16.3 | 11 | 7 | 101 | 5.8 | 8.5 | 6.4 | 4 |
| | S | 4.8 | 2.8 | 2.3 | | | 2.1 | 2.4 | | |

n = number x = average diameter s = standard deviation

TABLE 2--SUMMARY TABLE OF STRIP CRUISE DATA
LARAMIE PEAK, 1984

| STAND | DIAM(in) by attack class | | | No. ATTACKED TREES | | | No. INFESTED TREES/ACRE | | | ATTACK RATIO | TREND |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1984 | 1983 | P.O. | 1984 | 1983 | P.O. | 1984 | 1983 | P.O. | 1984/1983 | |
| Cottonwood Creek (1) | 11.2 | 11.7 | 7.0 | 15 | 6 | 1 | 2.5 | 1.0 | 0.1 | 2.5:1 | Inc. |
| Eagle Peak (2) | 11.5 | 10.3 | -- | 5 | 12 | -- | 0.5 | 1.2 | -- | 0.42:1 | Dec. |
| Total | | | | 20 | 18 | 1 | 3.0 | 2.2 | 0.1 | | |
| Average | 11.3±.1 | 11±.5 | | | | | 1.5 | 1.1 | | 1:1 | |

TABLE 3--VARIABLE PLOT DATA

| Stand | No. Plots | | Ponderosa Pine | Lodgepole Pine | Limber Pine | Aspen | Fir |
|---|---|---|---|---|---|---|---|
| Eagle Peak | 10 | DBH | 16.8 | 10.2 | -- | 5.6 | 6.4 |
| | | BA | 38.0 | 63.0 | -- | 34.0 | 0.83 |
| | | T/A[1/] | 5.4 | 19.7 | -- | 35.4 | 0.34 |
| Cottonwood Creek | 12 | DBH | 10.2 | -- | 4.0 | 4.7 | -- |
| | | BA | 154 | -- | .83 | 1.8 | -- |
| | | T/A | 64.0 | -- | .79 | 2.1 | -- |

1/ T/A--Trees per acre

Results of regression equations for prediction of percent stand losses to MPB are provided in Table 4. The Cottonwood Creek area would loose more trees per acre but would have a lower percent loss than the Eagle Peak area. The higher tree per acre loss is primarily due to a higher number of trees per acre available for infestation (Sartwell et al. 1975).

Ponderosa pine attacked by MPB prior to 1983 did not occur in the strip cruises; however there are 1982 and older kills scattered throughout the Laramie Peak area and, according to previous aerial detection flights, beetle activity has occurred at low intensity for at least the past five (5) years.3/ The Cottonwood Creek area is characterized by old growth Ponderosa pine and has fire and MPB history. Forty-seven (47) percent of the trees counted in the Eagle Peak area are lodgepole pine; however, no MPB attacks of this host were detected in the survey.

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3/ Personal communication (Lessard)

TABLE 4 -- Summary of prdeicted percent of stand and tree/acre losses to mountain pine beetle infestation in ponderosa pine Laramie Peak district Medicine Bow National Forest

| Survey Area | Current Condition | Increasing Phase | | Epidemic Phase | | Decreasing Phase | | Total % Loss to MPB | | Residual Stand |
|---|---|---|---|---|---|---|---|---|---|---|
| | T/A* | % | T/A | % | T/A | % | T/A | % | T/A | T/A |
| Cottonwood Creek | 425.2 | 1.8 | 8.0 | 19.4 | 80.0 | 1.7 | 5.7 | 23 | 93.7 | 331.0 |
| Eagle Peak | 114.8 | 2.8 | 3.2 | 30.0 | 33.4 | 2.6 | 2.0 | 35 | 38.5 | 76.3 |

*--T/A (Trees/acre)

## ALTERNATIVES

1) Do Nothing. Allow beetle activity to continue and accept losses to MPB. The alternative involves increased fire risk and aesthetic decline.

2) Chemical suppression. Cut, buck, and apply EPA recommended pesticides to infested logs. This alternative will have some impact on MPB population but overall stand susceptibility will not change. Access to infested trees places limits on this treatment.

3) Mechanical suppression. Same as (2-chemical treatment) except infested trees are bucked, piled, and burned or peeled--no chemical treatment.

4) Preventive sprays. Up to 2 years of protection against MPB infestation would be provided by spraying of Sevimol® prior to beetle flight (approx. July 15) (Gibson 1982). Preventive spraying is expensive and practical only where high value tree areas are treated (i.e.--picnic areas, campgrounds, etc.).

5) Uneven-aged management. Uneven-aged stands are less susceptible to to sustained MPB infestations than even-aged stands (Lessard 1981). They can be created by single tree or group tree selection. Stand structure should be maintained as a typical inverted J-curve with higher trees per acre below the seven (7" dbh) inch class and above the thirteen (13" dbh) inch class (Daniel, Baker. 1979) This management alternative may be preferred in areas of limited access or for long range re-entry scheduling, forty (40) years or more.

   Uneven-aged management will reduce stand susceptibility and provide for utilization of the timber resource. In the event of an epidemic in an uneven-aged stand, losses to the MPB will be from thirty (30) to fifty (50) percent less than the most susceptible even-aged stands of similar stocking.

6) Even-aged management. Extensive areas occupied by even-aged stands in the susceptible diameter range leads to large scale epidemics of MPB. If even-aged management is preferred, management areas should be broken up into a matrix of 30-50 acre units with a wide spectrum of age classes. Small susceptible stands are easier to monitor and require less reaction time and control effort should an epidemic develop. Also, the area diversity created will enhance all resource values (Lessard 1981).

## CONCLUSION

Based on nine (9) year predictions, up to twenty three (23) percent of the Ponderosa pine resource could be lost in the Cottonwood Creek area south of Laramie Peak. Up to thirty-five (35) percent loss of the timber resources (primarily P. pine) should be expected in the Eagle Peak area west of Laramie Peak.

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